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PROPOSED
INTERIM MEASURE/INTERIM REMEDIAL ACTION
DECISION DOCUMENT FOR THE SOLAR EVAPORATION PONDS
OPERABLE UNIT NO. 4

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

April 1992

ENVIRONMENTAL RESTORATION PROGRAM

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EXECUTIVE SUMMARY

This document is the Proposed Interim Measure/Interim Remedial Action (IM/IRA) Decision Document for Operable Unit No. 4 (OU4), the Solar Evaporation Ponds (SEPs). This document was prepared in accordance with the Rocky Flats Interagency Agreement (IAG), dated January 22, 1991, and applicable regulatory guidance documents. This IM/IRA document incorporates the United States Environmental Protection Agency (EPA) and Colorado Department of Health (CDH) comments on the draft IM/IRA Decision Documents dated July 1991 and August 1991.

Approximately 8 million gallons of excess liquids need to be removed from the 207-A and 207-B SEPs before the remaining sludges can be removed for solidification. Natural evaporation of pond liquids accounts for only 2 million gallons per year. Furthermore, water collected by an Interceptor Trench System (ITS), approximately 4 million gallons per year, is currently pumped into Pond 207-B North. Changes to the current operation of the SEPs are required to allow closure and remedial activities to proceed. Specifically, the addition of water to the ponds through precipitation and collection from the ITS must cease, an alternate means of storing and treating collected water is needed, and an accelerated means of removing excess pond liquids is required to allow removal of sludge and sediments from the SEPs. Additional activities beyond the scope of this IM/IRA, such as removal and solidification of sludges into pondcrete, further investigation, characterization, and remedial activities, will continue to occur at OU4.

The major components of the selected remedy include:

- The construction and utilization of three temporary surge tanks and associated piping to contain and transfer water collectedby the ITS

- Three portable flash evaporators and associated tanks to treat excess liquids contained in the 207-A and 207-B SEPs, and to treat future ITS collected waters.

The selected remedy is expected to pose a minimal risk to the health of workers, the general public, and the environment. The risk of the remedy is considered low because the proposed system operates as a closed loop. The risk due to the surge tanks is low because of the low concentration of contaminants in the ITS water. The risk to the public due to exposure to contaminated ground water is also low because there are no completed exposure pathways. Currently, this IM/IRA is anticipated to operate through 1995.

1.0 INTRODUCTION

This document is the Proposed Interim Measure/Interim Remedial Action (IM/IRA) Decision Document for Operable Unit No. 4 (OU4), the Solar Evaporation Ponds (SEPs). This document was prepared in accordance with the Rocky Flats Interagency Agreement (IAG), dated January 22, 1991, and applicable regulatory guidance documents. This IM/IRA document incorporates the United States Environmental Protection Agency (EPA) and Colorado Department of Health (CDH) comments on the draft IM/IRA Decision Documents, dated July 1991 and August 1991. This IM/IRA is expected to operate through 1995.

This IM/IRA document for OU4, the SEPs, is intended to facilitate implementation of the SEPs' RCRA partial closure actions. As such, the IM/IRA is being taken as an enabling activity to facilitate removal and solidification of pond sludges and site closure. This IM/IRA document is not related to the IM/IRA as referenced in the IAG. The IAG IM/IRA, scheduled in 1994, follows the Phase I RFI/RI report and would be presented only after the RFI/RI was completed and approved. The distinction between this IM/IRA and the IAG IM/IRA are the activities associated with pondcrete operations. Pondcrete operations are addressed in the Agreement In Principle (AIP), not the IAG, and thus this IM/IRA presents information regarding actions necessary before pondcrete operations can continue to be implemented. Thus, the IM/IRA actions presented in this decision document are focused only on operations relating to the flash evaporator and surge tank systems. Also, this IM/IRA is a mechanism for permitting the use of the proposed treatment (i.e., use of surge tanks and flash evaporators) as directed by EPA and CDH.

1.1 SITE NAME AND LOCATION

Rocky Flats Plant, United States Department of Energy (DOE), Golden, Colorado.

1.2 STATEMENT OF BASIS AND PURPOSE

This IM/IRA is necessary to stabilize wastes in the SEPs, so that subsequent characterization and remediation can be completed for this site. This decision document presents the selected interim remedial action for OU4, the SEPs, which was chosen to permit the required SEP closure activities to proceed, in accordance with the IAG, the Colorado Hazardous Waste Act (CHWA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), the Resource Conservation and Recovery Act (RCRA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for OU4, the SEPs, and is deemed a necessary component for continued closure activities of the SEPs.

1.3 ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this IM/IRA Decision Document, may present an imminent and substantial endangerment to public health, welfare or the environment.

1.4 IM/IRA PROJECTS

The SEPs are RCRA interim status regulated units that are currentlyundergoing closure activities. The removal of liquids and sludge is required to fulfill the intent of the AIP, which states in part "several past disposal sites (i.e., solar ponds) on the plant pose a high risk for further spread of contaminants into surface water, ground water and the soil. The ... site(s) require(s) special and accelerated actions by the DOE" (DOE, 1989b). A "no action" alternative to this IM/IRA is inconsistent with the AIP and the IAG, and was not considered for these activities because the ponds must be dewatered in order to proceed with partial closure activities and final remediation of the SEPs.

The objectives of this IM/IRA are to cease the addition of liquids (intercepted or trench water) to Pond 207-B North, and to remove excess liquids from the SEPs (207-A and 207-B North, 207-B Center and 207-B South) as expeditiously as possible in order to proceed with closure activities for the ponds consistent with state and federal laws, the IAG, the AIP and the protection of human health and the environment.

1.5 DESCRIPTION OF THE SELECTED REMEDY

The SEPs were formerly used to store and treat liquid process waste. Emplacement of process waste material into these ponds ceased in 1986. Present ongoing activities include evaporation of the liquids currently held in the ponds, removal and solidification of pond sludge, and site monitoring and characterization activities. The 207-B ponds (primarily the North impoundment) continue to be used for storage of water collected by the ITS.

Approximately 8 million gallons of excess liquids need to be removed from the 207-A and 207-B ponds before the remaining sludges can be removed for solidification. Pond 207-C is not included in this IM/IRA because the entire contents of the pond will be solidified. Natural evaporation of pond liquids accounts for only 2 million gallons per year. Furthermore, water collected by an ITS (approximately 4 million gallons per year) is currentlypumped into Pond 207-B North. Changes to the current operation of the SEPs are required to allow closure and remedial activities to proceed. Specifically, the addition of collected water to the ponds must cease, an alternate means of storing and treating collected water is needed, and an accelerated means of removing excess pond liquids is required to allow removal of sludge and sediments from the SEPs. Additional activities beyond the scope of this IM/IRA, such as the removal and solidification of sludges into pondcrete, further investigation, characterization, and remedial activities, will continue to occur at OU4.

The major components of the selected remedy include:

- The construction and utilization of three temporary surge tanks and associated piping to contain and transfer water collected by the ITS

- Three portable flash evaporators and associated tanks to treat excess liquids contained in the 207-A and 207-B SEPs and to treat collected waters.

1.6 DECLARATION

The interim action selected in this IM/IRA Decision Document is protective of human health and the environment, complies with federal and state applicable or relevant and appropriate requirements (ARARs) for this limited scope action, and is cost-effective. Although this interim action is not intended to address fully the statutory mandate for permanent solutions, to the maximum extent practicable, this interim action does utilize treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for the solar ponds, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as the principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to address fully the threats posed by the conditions at the solar ponds. Because thisis an interim measure/interim remedial action, review of the solar ponds will be ongoing as EPA, CDH and DOE continue to develop final remedial alternatives for the solar ponds under the IAG.

1.7 EPA AND CDH SUPPORT AND ACCEPTANCE OF THE SELECTED REMEDY

The IM/IRA Decision Document shall be final upon conclusion of the 60-day public comment period and EPA and CDH approval.

2.0 SITE CHARACTERIZATION

2.1 SITE NAME, LOCATION AND DESCRIPTION

The Rocky Flats Plant (RFP) is a government-owned and contractoroperated facility. The facility is part of a nationwide nuclear weapons research, development, production and plutonium reprocessing complex administered by the Rocky Flats Operations Office of the DOE. The operating contractor for the RFP is EG&G Rocky Flats, Inc. The facility manufactures components for nuclear weapons and conducts plutonium reprocessing. It has been in operation since 1951. The RFP fabricates components from plutonium, uranium, beryllium, and stainless steel. Historically, production activities have included metal fabrication, machining, and assembly. Both radioactive and nonradioactive wastes are generated in the process. Current waste handling practices involve on-site and off-site recycling of hazardous materials and off-site disposal of solid radioactive materials at another DOE facility.

The RFP is located in northern Jefferson County, Colorado approximately 16 miles northwest of Denver and 9 to 12 miles from the neighboring communities of Boulder, Broomfield, Golden, and Arvada (see Figure 2-1). The immediate area around the RFP is primarily undeveloped and agricultural land. The RFP is bounded on the north by State Highway 128, on the west by a parcel of land east of State Highway 93, on the south by a parcel of land north of State Highway 72, and on the east by Jefferson County Highway 17. Access to the plant is from an east access road exiting from Jefferson County Highway 17, or a west access road exiting from State Highway 93.

The facility is situated at an elevation of approximately 6,000 feet above mean sea level (msl). It is on the eastern edge of a geological bench known locally as Rocky Flats. The bench is approximately 5 miles wide and flanks the eastern edge of the foothills of the Rocky Mountains. The RFP consists of approximately 6,500 acres of federally-owned land in Sections 1 through 4, and Sections 9 through 15 of T2S, R70W, 6th Principal Meridian. Major buildings are located within the RFP Protected Area (PA) of approximately 400 acres. The PA is surrounded by a buffer zone of approximately 6,150 acres. The PA is within the controlled/security area (see Figure 2-2).

The SEPs are located in the central portion of the RFP on the northeast side of the PA. The SEP Waste Management Unit includes Ponds 207-A, 207-B North, 207-B Center, 207--B South, 207-C, and the ITS (see Figure 2-3). The SEPs are RCRA interim status regulated units that are currently undergoing closure activities. Activities associated with this IM/IRA would occur totally within the facility boundaries and

would be controlled by standard facility procedures in compliance with the appropriate environmental regulations.

The SEPs are currently configured as a series of five evaporation ponds (see Figure 2-3). Pond 207-A was placed into service in August 1956. Ponds 207-B, North, Center, and South were placed into service in June 1960. Pond 207-

C was constructed in 1970 to provide additional storage capacity and to allow the transfer and storage of liquids from the other ponds in order to perform pond repair work. These ponds were formerly used to store and treat liquid process waste having less than 100,000 picocuries per liter (pCi/1) oftotal long-lived alpha activity (DOE, 1980). These process wastes also contained high concentrations of nitrates as well as treated acidic wastes containing aluminum hydroxide. The ponds are also known to have received other wastes, including sanitary sewer sludge, lithium chloride, lithium metal, sodium nitrate, ferric chloride, sulfuric acid, ammonium persulfates, hydrochloric acid, nitric acid, hexavalent chromium, tritium, and cyanide solutions (Rockwell International, 1988).

Sludges from the SEPs have been removed from time to time to implement repair work on the pond liners and as part of routine waste management activities. As the sludges were removed, they were mixed with Portland cement and solidified as a mixture of sludge and concrete (pondcrete) for shipment to an off-site low-level radioactive waste disposal site.

Emplacement of process waste material into these ponds ceased in 1986 because of changes in RFP waste treatment operations. Present ongoing activities include evaporation of the liquids currently held in the ponds, and site monitoring and characterization activities. The 207-B ponds (primarily the North impoundment) continue to be used for storage of intercepted seepage water collected by the ITS.

Construction of interceptor trenches during the period from October 1971 through April 1974 was initiated to prevent natural seepage and pond leakage from entering North Walnut Creek. This system has been replaced by the current ITS (see Figure 2-3).

The ITS (also known as the French Drain System) was installed in the hillside north of the SEPs. It became active in April 1981 and is currently in use. The depths of the drain system ranges from approximately 1 to 27 feet below the ground surface, with typical depths of 4 to 16 feet (Rockwell International, 1988). Water collected in the ITS flows by gravity to the interceptor trench pump house (see Figure 2-3). The water from the pump house is currently pumped to Pond 207-B North. The current amount of intercepted seepage collected by the ITS is estimated to be approximately 4 million gallons per year. The maximum amount of water collected in any one week was 700,000 gallons in June 1987 (Rockwell International 1988).

2.1.1 Topography

The RFP is located along the eastern edge of the southern Rocky Mountain region immediately east of the Colorado Front Range. The plant site is located on a broad, eastward sloping pediment that is capped by alluvial deposits of Quaternary age (Rocky Flats Alluvium). The pediment surface has a fan-like form with its apex near the mouth of Coal Creek Canyon and distal margins approximately 2 miles east of the RFP. The tops of alluvialcovered pediments are nearly flat but slope gently eastward at 100 to 50 feet per mile (EG&G, 1991d). At the RFP the pediment surface is dissected by a series of east-northeast trending stream-cut valleys. The valleys containing Rock Creek, North and South Walnut Creeks, and Woman Creek lie 50 to 200 feet below the level of the older pediment surface. These valleys are incised into the bedrock underlying alluvial deposits, but most bedrock is concealed beneath colluvial material accumulated along the gentle valley slopes.

A topographic map of OU4 (see Figure 2-4) illustrates the area surrounding the SEPs and the proposed location for the temporary surge tanks. The siting for the temporary surge tanks is explained in Section 3.1.2 of this document.

2.1.2 Meteorology

The area surrounding the RFP has a semiarid climate characteristic of much of the central Rocky Mountain region. Based on precipitation recorded between 1953 and 1976, the mean annual precipitation at the plant is 15 inches. Approximately 40 percent of the precipitation falls during the spring season, much of it as wet snow. Thunderstorms (June to August) account for an additional 30 percent of the annual precipitation. Autumn and winter are drier seasons, accounting for 19 and 11 percent of the annual precipitation, respectively. Snowfall averages 85 inches per year, falling from October through May (DOE, 1980).

Winds at the RFP, although variable, are predominantly from the west-northwest. Stronger winds occur during the winter, and the area occasionally experiences Chinook winds with gusts up to 100 miles per hour. The canyons along the Front Range tend to channel the air flow during both upslope and downslope conditions, especially when there is strong atmospheric stability (DOE, 1980).

Rocky Flats meteorology is strongly influenced by the diurnal cycle of mountain and valley breezes. Two dominant flow patterns exist, one during daytime conditions and one at night. During daytime hours, as the earth heats, the mountains receive more direct sunlight than the plain and valleys. The result is a general trend for air flow to travel toward the higher elevation (upslope). The general air flow pattern during upslope conditions for the Denver area is typically north to south, with flow moving up the South Platte River Valley and then entering the canyons into the Front Range. After sunset, the air against the mountain side is cooled and begins to flow toward the lower elevations (downslope). During downslope conditions, air flows down the canyons of the Front Range onto the plain. This flow converges with the South Platte River Valley flow moving toward the north-northeast.

Temperatures at the RFP are moderate. Extremely warm or cold weather is usually of short duration. On average, daily summer temperatures ranges from 55 to 85 degrees Fahrenheit (F), and winter temperatures range from 20 to 45 F. Temperature extremes recorded at the plant range from 102 F on July 12, 1971, to -26 F on January 12, 1963. The 24-year daily average maximum temperature for the period 1952 to 1976 is 76 F, the daily minimum is 22 F, and the average mean is 50 F. Average relative humidity is 46 percent (DOE, 1980).

2.1.3 Nearby Populations, Uses of Adjacent Land and Natural Resources

The population, economics, and land use of the areas surrounding the RFP are described in a 1989 Rocky Flats vicinity demographics report by DOE (DOE, 1990b). This report divides general use of areas within zero to 10 mi (zero to 16 km) of the RFP into residential, commercial, industrial, parks and open spaces, agricultural and vacant, and institutional classification, and considers current and future land use near the plant.

The majority of residential use within 5 miles (8 km) of the RFP is located immediately north and southwest of Standley Lake (IHSS 201). Single family residents are also located immediately east and south of the RFP. Figure 2-5 shows the 1989 population distribution within areas up to 5 miles from the RFP. Commercial development is concentrated near the residential developments north and southwest of Standley Lake, and around the Jefferson County Airport approximately 3 miles (4.8 km) northeast of the RFP. Industrial land use within 5 miles (8 km) of the plant is limited to quarrying and mining operations. Open Space lands are located northeast of the RFP near the City of Broomfield, and in small parcels adjoining major drainages and small neighborhood parks in the cities of Westminster and Arvada. Standley Lake is surrounded by Standley Lake Park. Irrigated and non-irrigated croplands, producing primarily wheat and barley, are located northeast of the RFP near the cities of Broomfield, Lafayette, and Louisville, north of the RFP near Louisville and Boulder, and in scattered parcels adjacent to the eastern boundary of the

plant. Several horse operations and small hay fields are located south of the RFP. The demographics report characterizes much of the vacant land adjacent to the RFP and the reservoirs as rangeland (DOE, 1990b).

This proposed action would be within the existing RFP boundaries and would not adversely impact adjacent agricultural areas or recreation areas. The action would tend to enhance the subsurface environment in the vicinity of the SEPs and limit potentially adverse environmental effects from contaminant migration off-site.

The land use immediately adjacent to OU4 consists of plant process areas and the buffer zone for the facility.

2.1.4 Site and Local Surface Hydrology

Several ephemeral streams flow through the RFP area. Three of these streams (North Walnut Creek, South Walnut Creek, and Woman Creek) originate within the RFP boundary and flow generally eastward from the plant site. The Walnut Creek and Woman Creek drainages within the boundary of the RFP are being investigated under the IAG as OU5 and OU6, respectively. A fourth ephemeral stream, Rock Creek, originates in the Buffer Zone northwest of the main production facility and flows northwest from the RFP (see Figure 2-6). Other surface water features in the vicinity of the plant included a complex network of manmade diversions and impoundments. Flow into and within the surface water features results from direct surface runoff, base flow from ground water, and diversions and wastewater from human-related activities.

Surface water drainage from the SEPs area is toward North Walnut and South Walnut Creeks. A series of retention ponds known as the A-series ponds are located on North Walnut Creek and a series of retention ponds known as the B -series ponds are located on South Walnut Creek (see Figure 2-6). South Walnut Creek joins North Creek and an unnamed tributary coming from the landfill area, approximately 0.7 mile downstream of the eastern edge of the plant security area, within the buffer zone. The Walnut Creeks then flow eastward approximately 1 mile to Great Western Reservoir. North Walnut Creek is an eastward flowing stream located north of the SEPs area. Surface runoff patterns indicate flow enters the drainage from the SEPs area, the 700 Building Complex, the 300 Building Complex, and general surface runoff from the north and west sides of the plant (Rockwell International, 1988).

The A-series ponds on North Walnut Creek are designated A-1, A-2, A-3, and A -4, from west to east. Ponds A-1 and A-2 are used only for spill control, and North Walnut Creek stream flow is diverted around them through an underground pipe. Until 1980, Ponds A-1 and A-2 were used for storage and evaporation of laundry water. Pond A-3 receives the North Walnut Creek stream flow and runoff from the northern portion of the Plant. Pond A-4 is designed for surface water control and for additional storage capacity for overflow from Pond A-3.

The discharge from the ponds are regularly monitored to document compliance with National Pollutant Discharge Elimination System (NPDES) permit requirements. In addition to NPDES monitoring requirements, all discharges are monitored for plutonium, americium, uranium, and tritium concentrations.

2.1.5 Site and Local Hydrogeology

Two hydraulically-connected ground water systems exist in the RFP area: the shallow system which is present is saturated surficial deposits (the upper hydrostratigraphic unit) in many areas of the RFP, and the deeper system in claystones and sandstones of the underlying Arapahoe Formation (the lower hydrostratigraphic unit). The shallow unconfined system is recharged by infiltration from incident precipitation and from surface and base flow water (such as drainages and reservoirs). Ground water flow is generally to the east and toward drainages. Ground water locally discharges as seeps or springs in drainages, especially where the surficial deposit/bedrock contact is exposed. Large water table fluctuations may occur in the shallow system in response to seasonal variations in recharge and discharge, with the highest water levels generally occurring during the months of May and June and thelowest water levels generally occurring in January and February. As a result of these fluctuations, the lateral and vertical extent of saturated surficial deposits varies seasonally. Recent work has estimated hydraulic conductivities for the RFP geologic units at 10[-5] cm/sec in the Rocky Flats Alluvium, 10[-5] cm/sec in subcroppings Arapahoe Formation sandstones, 10[-6] cm/sec in unweathered Arapahoe Formation sandstones, and 10[-7] cm/sec in both weathered and unweathered Arapahoe Formation claystones (DOE, 1991e; EG&G, 1991b).

Ground water in the lower hydrostratigraphic unit exists primarily in lenticular sandstone bodies within claystone. Ground water flow in the upper hydrostratigraphic unit occurs in the unconsolidated Quaternary surficial deposits and the shallow sandstone within the bedrock. Recharge to this unit consists of infiltration from streams and precipitation. The lower hydrostratigraphic unit is found in the deeper bedrock sandstones which exhibit confined conditions. Recharge to this unit occur primarily from base flow and leakage from the overlying claystone. Ground water in the lower hydrostratigraphic unit flows east towards a regional discharge area along the South Platte River some 20 miles (32 km) east of the RFP. Local seeps occur along the sides of drainages where the bedrock crops out. Calculated horizontal linear flow velocities for the bedrock system's average 0.1 ft/day (0.03 m/day) in the sandstone and approximately 9 x 10[-4] ft/day (2.7 x 10[-4] m/day) in the claystone.

Ground water generally flows toward the east in the SEPs area in the surficial materials and weathered bedrock portions of the shallow ground water system. In the surficial materials, ground water flow diverges somewhat in two directions: to the northeast toward North Walnut Creek and to the eastsoutheast toward South Walnut Creek. In weathered bedrock, like surficial materials, ground water flows to the northeast and southeast. This ground water system is locally influenced by topography, the configuration of the top of bedrock,and the ITS north of the ponds. Consistent with regional recharging of the Arapahoe Formation in this locality, it is assumed that ground water flows eastward within the subcropping sandstones.

Estimates of the vertical hydraulic gradient between surficial materials and weathered bedrock revealed downward saturated flow between surficial materials and weathered bedrock. Water levels needed for the calculations were obtained from ground water elevation data measured in 1990. Upward vertical flow has been reported in previous investigations.

The first and third quarters of 1990 represented the high and low flow regimes, respectively, for the vicinity. Alluvial ground water enters the SEPs area from the west and flows east and then northeast or southeast. Downgradient of the ponds to the north, most of the colluvial materials on the hill slope were removed during construction of the ponds and the ITS. Alluvial ground water in this area seeps into weathered bedrock where it is collected by the ITS or consumed by evapotranspiration. North Walnut Creek and the waste management area are separated by a region of unsaturated alluvium or the absence of surficial materials above the water table. Although this region is extensive north of the ponds, flow toward North Walnut Creek is evident northeast of the ponds. Additionally, small regions of absent or unsaturated alluvium are evident west, east, and south of the solar ponds. These regions do not appear to impede ground water flow to the southeast. (DOE, 1991e; EG&G, 1991b).

2.1.6 Ecology

Ecosystems in the RFP buffer zone and surrounding areas are typical for the foothill ravine and High Plains portions of Colorado. Aquatic ecosystems include perrenial and intermittent streams, and several types of man-made ditches, canals, ponds and reservoirs. Terrestrial ecosystems include grasslands, shrublands and woodlands, areas of reseeded and barrenlands, and horticultural plantings. The Ecology Standard Operating Procedures desribe 6 aquatic and 17 terrestrial habitat types. Many areas east and south of RFP have been converted to uses like commercial and residential development, agricultural, and grazing land, and water control and storage. Within the RFP Buffer Zone, there has been extensive grazing by both native wildlife and domestic livestock. Domestic livestock have been excluded for more than 20 years from most of the buffer zone. In the west side of the buffer zone is a relict stand of plants including big bluestem, little bluestem and other plants of the tallgrass prairie. Virgin stands of grass like this, located in areas dominated by shortgrass steppe plants are rare. Because of the elevation, water regime and location between the High Plain and Intermontane physiographic regions, many species of plants and animals usually found in different habitats intermingle in the RFP buffer zone. The result is an extremely rich and diverse population of native plants and animals.

A variety of vegetation is found within the buffer zone surrounding RFP. Included are species of flora representative of tall-grass prairie, short-grass plains, lower montane, and foothill ravine regions. Riparian vegetation exists along the site's drainages and wetlands. None of these vegetative species present at RFP have been reported to be on the endangered species list (EG&G, 1991f). Since acquisition of RFP property, vegetative recovery has occurred, as evidenced by the presence of disturbance-sensitive grass species such as big bluestem (Andropogon gerardii) and side oats grama (Bouteloua curtipendula) (DOE, 1980).

The fauna inhabiting the RFP and its buffer zone consists of species associated with western prairie regions. The most common large mammal is the mule deer (Odocoileus hemionus), with an estimated 100 to 125 permanent residents. There are a number of small carnivores, such as the coyote (Canis latrans), red fox (Vulpes fulva), striped skunk (Mephitis mephitis), and long-tailed weasel (Mustela frenata). Small herbivores can be found throughout the plant complex and buffer zone, including species such as the pocket gopher (Thomomys talpoides), cottontail (Sylvilagus sp.), white-tailed jackrabbit (Lepus townsendii), and the meadow vole (Microtus pennsylvanicus) (DOE, 1980).

Commonly observed birds include western meadowlarks (Sturnella neglecta), horned larks (Eremophila alpestris), mourning doves (Zenaidura macroura), and vesper sparrows (Pooecetes gramineus), western kingbirds (Tyrannus vociferans), black-billed magpies (Pica pica), American robins (Turdus migratorius), and yellow warblers (Dendroica magnolia). Killdeer (Charadrius vociferus), and red-winged black birds (Agelaius phoeniceus) are seen in areas adjacent to ponds. Mallards (Anas platyrhynochos) and other ducks (Anas sp.) frequently nest and rear young on several of the ponds. Common birds of prey in the area include marsh hawks (Circus cyaneus), red-tailed hawks (Buteo jamaicensis), ferruginous hawks (Buteo regalis), rough-legged hawks (Buteo lagopus), and great horned owls (Bubo virginianus) (DOE, 1980).

Bull snakes (Pituophis melanoleucus) and rattlesnakes (Crotalus sp.) are the most frequently observed reptiles. Eastern yellow-bellied racers (Coluber constrictor flaviventris) have also been seen. The eastern shorthorned lizard (Phrynosoma douglassi brevirostre) has been reported on the site, but these and other lizards are not commonly observed. The western painted turtle (Chrysemys picta) and the western plains garter snake (Thamnophis radix) are found in and around many of the ponds (DOE, 1980).

Two procedures which concern identification and management of threatened and endangered species at RFP currently are being prepared by the EG&G National Environmental Policy Act (NEPA) Group. These are the draft "Identification and Reporting of Threatened and Endangered and Special ConcernSpecies," administrative procedure NEPA.12, Rev. 0, and the draft "Protection of Threatened and Endangered and Special Concern Species," operations procedure FO.21, Rev. 0.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Past and current waste handling practices at the Rocky Flats Plant dictate that environmental restoration at the facility be conducted in accordance with two environmental laws: the Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments Act; and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

RCRA regulations apply to currently operating hazardous waste treatment, storage and disposal facilities, and the RCRA corrective action provisions are implemented to remediate releases of hazardous materials from these facilities. CERCLA regulations apply when hazardous substances have been released from abandoned or uncontrolled hazardous waste sites as well as releases at federal facilities. CERCLA regulations also apply to releases from operating facilities that may pose a threat to human health and/or the environment. DOE, EPA, and the State of Colorado signed a Federal Facilities Agreement (also known as the IAG) under both RCRA and CERCLA which governs the environmental restoration activities at RFP, including this IRA. The environmental restoration activities at the RFP fall under the jurisdiction of both laws.

The SEPs are RCRA interim status regulated units that are currently undergoing partial closure activities. Leakage from the ponds has contaminated soils and ground water with nitrates, heavy metals, and radioactive material. A closure plan submitted to the regulatory agencies on July 1, 1988, called for in-place closure of contaminated liners and subsoils. A proposal was submitted to the regulatory agencies in February 1989 to modify the closure plan for removal of contaminated liners and subsoils to achieve residual contaminant concentrations protective of human health. Closure activities include: dewatering the impoundments; removing, solidifying, and disposing the pond sludges and sediments at the Nevada Test Site; capping the area with a RCRA cap; and collection and treatment of contaminated ground water (Rockwell International, 1988).

This IM/IRA will facilitate the dewatering of the impoundments and allow closure activities to fulfill the intent of the AIP.

2.3 SUMMARY OF CONTAMINANTS ASSOCIATED WITH THIS IM/IRA

The scope of this IM/IRA is limited to the managing and treatment of liquids contained in ponds 207-A, 207-B North, 207-B Center, 207-B South, and the water collected by the ITS. Pond 207-C is not included in this IM/IRA because the pond does not require dewatering.

Detailed characterizations of the pond wastes were performed during 1986, 1987, 1988, and 1991. A selected summary of these characterizations is included in Tables 2.1 through 2.5 of this document. The tables are a compilation of the analytical results from 1986-1991. A complete listing of analytical data is contained in Appendix C.

At present, Pond 207-A is nearly empty and contains water transferred from the 207-B series ponds, and water derived from incident precipitation

(Rockwell International, 1988). Pond 207-A was completely cleaned of sludge and water in 1988.

2.3.1 Ponds 207-B North, Center, and South

Ponds 207-B North, Center, and South contained process wastes until 1977 when the ponds were cleaned and the linings replaced. Waste materials from these ponds were disposed of at an off-site low level radioactive waste disposal site. Since 1977 these ponds have held treated sanitary effluent, treated water from the reverse osmosis facility, backwash brine from the reverse osmosis facility, and ground water pumped back from the SEPs' ITS. Ponds 207-B Northand Center generally have low concentrations of nitrates, metals, and radionuclides. Nitrate concentrations in the pond liquids were at or below drinking water standards during the same time period (Rockwell International, 1988). All 207-B ponds are currently used to store intercepted water collected by the ITS north of the ponds.

2.3.2 Pond 207-C

Pond 207-C was constructed to provide additional storage capacity and to enable the transfer and storage of liquids from the other ponds while the latter were repaired. Pond 207-C is not included in this IM/IRA because the entire contents of the pond will be solidified. The data in Table 2.5 is presented for informational purposes only.

2.3.3 Interceptor Trench System (ITS)

The ITS was constructed on the hillside north of the SEPs to prevent natural ground water seepage and pond leakage from entering North Walnut Creek. Water collected in the system flows by gravity to the ITS pump house and currently is pumped to the 207-B ponds.

Sampling station SW-095 is located within the wet well of the ITS pump house and is representative of the water quality which is currently pumped to the 207-B ponds. A summary of ITS water quality is contained in RFEDs and the data is currently being validated. A summary of select analytical data of ITS water quality (SW-095) is presented in Table 2.6. The complete data for SW-095 is included in Appendix A.

Water quality analyses of ITS water indicate the presence of inorganic constituents (particularly nitrate), radionuclides, and sporadic detections of low-level volatile organic compounds (VOCs). Inorganic constituents and radionuclides are typically present in the general solar pond area and are present in both ground water and seepage flows. Sporadic VOCs detections are thought to be predominately contributed by the flow from the West Collector of the ITS. The West Collector intercepts ground water flow, surface runoff, and flow from the Building 774/771 drain area (ASI, 1991).

2.4 COMMUNITY PARTICIPATION

In accordance with the Interagency Agreement (IAG), DOE has prepared this IM/IRA Decision Document to allow the public an opportunity to review and comment on the selected remedy.

DOE will open a 60-day comment period. DOE will hold a public hearing on this Proposed IM/IRA Decision Document, if requested to do so by the public, EPA or the State. The Proposed IM/IRA Decision Document is a concise document that (a) indicates the objective of the IM/IRA; (b) discusses the selected remedy; (c) provides the rationale for the selected remedy; (d) presents an ARAR analyses, and; (e) discusses how the interim remedy selected will beconsistent with the final remedy for the OU4.

After receipt of EPA, State and/or public comments concerning the Proposed

IM/IRA Decision Document, DOE will prepare a Final IM/IRA Decision Document for EPA and State review and approval in accordance with paragraph 150 of the IAG, which will include a response to comments received. As stated in the IAG, "DOE will not commence any remedial/corrective activities associated with an IM/IRA until EPA and the State have approved the Final IM/IRA Decision Document and Responsiveness Summary." DOE will make the EPA and State approved Final IM/IRA Decision Document and Responsiveness Summary available to all interested parties 10 days prior to commencing the operation of remedial/corrective activities associated with the IM/IRA.

The Final Decision Document for this IM/IRA will include deadlines for implementation of the IM/IRA and shall be supported by the Administrative Record. The supporting Administrative Record shall be consistent with CERCLA and shall include, but not be limited to, significant facts and studies supporting the initial decision to conduct this IM/IRA, all comments received concerning the final decision on the action, EPA and State comments concerning the IM/IRA, and the DOE response to those comments.

2.5 SCOPE AND ROLE OF THE IM/IRA

The Solar Evaporation Ponds are currently undergoing partial closure activities. Water collected by the ITS is currently discharged into the 207-B ponds. The ponds (except for 207-C) must be dewatered to a state which will allow the removal of the sludges for solidification into pondcrete. In order to facilitate the dewatering of the ponds in an expedited fashion the addition of ITS water must cease. Therefore, storage and treatment of the intercepted water and treatment of excess pond liquids must occur in an alternate fashion. The most effective means of storage of the intercepted water is storage in temporary tanks. The most effective means of treatment of the excess pond liquids and the intercepted water is through the use of three portable flash evaporators. A complete description of the process is included in Section 3.0 of this document.

This IM/IRA is intended to be consistent with the final remedy for the Solar Evaporation Ponds. In fact, if the three portable flash evaporators and temporary surge tanks are not installed and operated, the removal and solidification of the sludges into pondcrete cannot occur. The removal of liquids and sludge is required to fulfill the intent of the AIP, which states, "several past disposal sites (i.e., solar ponds) on the plant pose a high risk for further spread of contaminants into surface water, ground water and the soil. The ... site(s) require(s) special and accelerated actions by the DOE." Such actions will be performed in full compliance with state and federal environmental laws (DOE, 1989b).

2.6 SUMMARY OF SITE RISKS

The OU4 IM/IRA is intended to facilitate implementation of the SEPs' partial closure actions and to stabilize the operable unit by removing the source materials. As such, the IM/IRA is being taken as an enabling activity to facilitate pondcrete operations, site closure, and remedial action. The proposed actions are not being taken in response to Agency guidance which directs interim actions to be taken in response to an immediate site threat to or to take advantage of an opportunity to reduce site risk quickly (EPA, 1991a).

The implications of this determination affect the summary of site risk to be performed below. In a July 12, 1991 letter, CDH and EPA provided guidance to DOE for issuing the Proposed Decision Document for this IM/IRA. This guidance instructed the Summary of Site Risks to "focus on the risks that the interim action is intended to address and should provide rationale for the limited scope of the action." As indicated above, the IM/IRA is not beingproposed in response to site hazards. The action is being proposed as an enabling activity to facilitate pondcrete operations, site closure, and remedial action. The Summary of Site Risks will focus on the potential public health and environmental health impacts associated with operation of the flash evaporator system.

A key assumption of this pathway-based qualitative risk assessment is that the ground water pathway is not complete. This is a matter of fact that should be taken into consideration regardless of the presumed efficiency of the collection system (ITS). Specifically, there currently is no human receptor exposed to ground water containing contaminants released from the SEPs. This is because the plume is contained on the RFP. As a result, there are no domestic users of ground water in the vicinity of the SEPs contaminant plume. Additionally, the distance from the SEPs to the nearest potential receptor is very significant which suggests a low probability that contaminated ground water from the SEPs would be available for a human to access in any reasonable foreseeable time. Municipally supplied domestic water is readily available in the vicinity of RFP. Since no drinking water is available, the assessment that exposure to contaminants emanating from the SEPs via a ground water pathway is improbable.

The information provided in this section is included for the general understanding of the site risks, and are not quantifiable statements. It is not the intent of this paragraph to imply that the IM/IRA will characterize and remediate all ground water contamination which originated from the SEPs. As stated previously, characterization of the ground water/surface water interrelations shall be performed during the RFI/RI activities.

Whatever the ITS efficiency, implementation of the proposed IM/IRA will not significantly alter the ground water pathway relative to potential human exposure. Assuming 100 percent efficiency of the ITS is lessimportant than the suggestion that the ground water pathway is incomplete. Additionally, future and more detailed risk assessment evaluations both qualitative and quantitative will be performed in the continuing Phase I and Phase II evaluation/investigations of the SEPs (OU4).

2.6.1 Pathway Exposure Assessment

The conceptual environmental exposure pathway resulting from the proposed IM/IRA is provided in Figure 2-7. Pertinent features of the exposure pathway include:

- Case A: This block model illustrates the primary exposure pathway associated with conditions as they currently exist. This includes two principal exposure pathways. Pathway A1 is the ground water contamination exposure route. As indicated on Figure 27, there is no contaminant receptor; rather, ground water is intercepted in the interceptor ditch and returned to the SEPs (Pond 207-B). Case A also includes an air pathway (A2) by which compounds can be released from the SEPs and distributed by airborne transport to offsite receptors, workers, or ecological receptors. Pathway A2 is considered to be a negligible exposure mechanism because of the (1) very low contaminant concentrations in the pond waters, (2) the small flux of contaminants released from the pond waters, and (3) the large dispersion and dilution factors associated with airborne transport.

- Case B: Case B conceptually illustrates how the proposed IM/IRA will modify the primary pathway (Case A) through introduction of a secondary pathway. The secondary pathway truncates the recirculation loop and shunts the contaminated ground water from the interceptor ditch to the flash evaporator system. The secondary pathway introduces a new exposure pathway (B1) which originates at the flash tank. Volatile and possibly nonvolatile compounds may be "flashed" (vaporization or particulate aerosolization) as they encounter the pressure differential of the flash tank. Once released, aerosolized compounds can enter the atmosphere by passing through the system vent apparatus. Once in the atmosphere, aerosolized compounds could be transported to off-site receptors, nearby workers, or ecological receptors in the immediate vicinity by dispersion in the atmosphere.

A very important physical system that is included as a design feature of the IM/IRA that interrupts the secondary pathway is not featured on Figure 2-7. This is a high efficiency particulate air (HEPA) filter on the system vent to remove any aerosolized particulate matter before discharge to the atmosphere.

A review of Figure 2-7 indicates that only pathways A2 and B1 are potentially complete. As discussed above, neither potentially complete pathway is expected to present an appreciable exposure source to the off-site public, workers, or ecological receptors.

2.6.2 Chemicals of Concern

The SEPs, as indicated on Figure 2-7, are the source of chemical compounds that may enter any of the exposure pathways. Chemicals of concern (COCs) (from Tables 2.1 through 2.5) are the compounds that would most likely present significant human health hazards in the event that sufficient exposure conditions and concentrations were met. A review of available analytical data suggests that very few compounds, characteristic of the SEPs, are notably toxic to humans. Additionally, those compounds that could potentially pose a human health threat are generally at very low concentrations. A brief discussion of potential COCs follows.

The potential contaminants of concern for this qualitative assessment can be summarized as: (1) certain radionuclides such as Pu[-239] and Am[241], (2) certain heavy metals such as beryllium, cadmium and chromium, and (3) a limited number of VOCs such as carbon tetrachloride and trichloroethylene.

2.6.2.1 Radionuclides

Pu[-239] and Am[-241] have been detected in the SEP waters. Aqueous concentrations of Pu[-239] of 0 to 660 pCi/l have been reported. Am[-241] has been detected at 200 pCi/l. Additionally, tritium and uranium have been detected in waters from the SEPs.

2.6.2.2 Metals

Metals, including beryllium, cadmium and chromium have been detected in the SEP waters at concentrations greater than background. Aqueous concentrations (from Tables 2.1 through 2.5) reported for some metals associated with the solar evaporation ponds are listed below:

2.6.2.3 Organics

Organic chemicals have been reported occasionally in samples (near the detection levels) obtained from the ITS water. The data does not show consistent occurrence of organics. Organics reported to occur infrequently that are notable from a human health perspective include carbon tetrachloride and trichloroethylene. Other organics (such as phenols) occur sporadically and are also in low concentrations in the data. This occurrence does not suggest that they should be considered as COCs. Sporadically occurring detections of organics have been used in this risk assessment, therefore this assessment is considered conservative.

2.6.3 Toxicity Assessment

The groups of compounds identified as contaminants of concern have the potential for producing adverse health effects in humans under certain conditions of exposure. A brief summary of the more relevant human toxicity information on the groups of compounds identified as contaminants of concern follows.

2.6.3.1 Radionuclides

EPA regards radionuclides as human carcinogens. Normally, carcinogenicity is the principal human toxicity concern.

2.6.3.2 Metals

Heavy metals, such as those associated with the SEPs, are reported to produce systemic toxic effects in humans. Additionally, EPA regards some heavy metals (e.g., beryllium, cadmium, chromium) as possible human carcinogens.

2.6.3.3 Volatile Organics

VOCs such as those associated with the ITS water, are reported to produce systemic toxic effects in humans. Additionally, EPA regards some VOCs (e.g., carbon tetrachloride and trichlorethylene), as possible human carcinogens.

The qualitative pathway model employed in this analysis indicates that neither exposure concentration or duration of exposure would be sufficient to produce adverse health effects from chronic exposure.

2.6.4 Risk Characterization

From a qualitative perspective, operation of the flash evaporator system will not introduce any additional risks to workers or the off-site public nor will it appreciably reduce the existing site risks. Observations that support this evaluation are:

- There is no complete ground water pathway (see Figure 27). Rerouting contaminated ground water to the flash evaporator system does not affect the risk associated with exposure pathway A1.

- The potentially completed airborne pathway from the SEPs to off-site receptors and workers (exposure pathway A2) will be truncated as a result of implementation of the IM/IRA. This is because, as recirculation of contaminated ground water (back to the SEPs) ceases, the source term (i.e., SEP water) will diminish. As the source term diminishes, the potential for exposure to contaminants through the airborne pathway will also decrease. As notedpreviously, exposure pathway A2 is considered to be a negligible source of exposure to the off-site public and workers.

- Implementation of the IM/IRA introduces the secondary B2 pathway. Conceptually, this results in a translocation of the exposure pathway A2 to the flash evaporator system vents (see Figure 2-7). As noted previously, exposure pathway A2 is considered to be a negligible source of exposure to the off-site public and workers. The potential risks of this pathway are further reduced by application of the physical systems design feature of the IM/IRA that interrupts the secondary pathway. The HEPA system is capable of an approximately 99.9 percent removal efficiency for aerosolized particulates.

3.0 DESCRIPTION AND ANALYSIS OF SELECTED REMEDY

The selected remedy for this IM/IRA includes the use of temporary surge tanks and three portable flash evaporators. The "No Action" alternative was dismissed because the ponds must be dewatered in order to proceed with partial closure activities and final remediation of the ponds. Furthermore, the consequence of the "No Action" alternative is inconsistent with the AIP and IAG.

3.1 DESCRIPTION OF SELECTED REMEDY

The selected remedy is the use of three portable flash evaporators to accelerate the removal of liquids from the 207-A and 207-B SEPs. The three portable evaporators are also needed to treat water that is currently discharged into the 207-B Pond from the ITS located north of the ponds. In order to prevent additional accumulation of water in the 207-B Pond, temporary surge tanks will be built in the vicinity of the pond to hold the ITS water beforeit is sent to the three portable evaporators.

Water will be pumped from the ponds and the surge tanks to the three portable evaporator systems located within a building near the solar ponds (Building 910). The final concentrate from the evaporators will be cemented in the pondcrete and/or saltcrete processes to meet defense waste acceptance criteria for disposal of low level mixed waste. Distillate from the evaporators will be discharged into one of the three 7,000-gallon batch tanks for sampling. Section 3.1.1.4 and Appendix B of this document explains the sampling and analytical requirements. Distillate exceeding the allowable conductivity limit (150 micro mho/cm) will be reprocessed. Distillate meeting the general characteristics of commercially available raw water will be reused as makeup water in the raw water or condensate systems on plant site. A 500,000-gallon tank will serve as a distillate holding tank from which water will be supplied on demand into the raw water or condensate systems.

3.1.1 Treatment System Components

Three mechanical/thermal forced evaporator systems will be installed. Each system consists of a vapor compression (VC) unit installed in series with a multiple-effect multiple-stage (MEMS) flash evaporator. The distillate from both the VC and MEMS is moved by differential pressure into a surge tank. The system, including VC and MEMS bodies is maintained at a vacuum by an eductor system which has as its motive force, the recirculation of distillate. During system operations over pressure protection is provided by a temperature sensor (which equates to saturation pressure) which shuts the entire unit down when temperature reaches 205 to 210 F. As a further precaution to prevent particulate air emissions from the system, the concentrate tank is vented to atmosphere via a HEPA filter, thus, there will be no contaminated air emission from these units.

Operators of the evaporation units will be formally trained and qualified. The training will include theory of operations, system components, principles of operations, system interrelationships, protective devices, and practical factors. The training and qualification will be validated in accordance with existing plant procedures.

3.1.1.1 Location and Equipment Description

Building 910, located south of Pond 207-B South, will be used to house the forced evaporation equipment. This building was originally constructed for a reverse osmosis (RO) system to treat RFP sanitary effluent.

The location of Building 910 and its existing tank storage capacity made it the optimal location for the evaporation equipment. Building 910 is a concrete structure with concrete floors and roof. On the main floor of Building 910, there are three rooms that will be used: the Process Room, Chemical Prep/Make-up Room and Operating Personnel Room. The lower level (basement) of Building 910 contains holding tanks, transfer pumps and ancillary equipment for the evaporator products. Some equipment in Building 910 is being stripped out to accommodate the evaporation equipment. All existing equipment that will be reused for the evaporation project will be inspected and/or tested.

Main Floor Building 910

Process Room: The Process Room is located at the west side of the main floor of Building 910. There will be three vapor compression (VC) units and three multiple-effect, multiple-stage (MEMS) flash evaporators centrally located. A duplex filter station, EDTA injection tank and nitric acid injection tank will be located at the northwest corner inside a bermed area. Three natural gas-fired generators located outside and east of Building 910 will provide electrical power to compressors, pumps and some ancillary equipment, and exhaust heat to the MEMS. All of the doorways into this room will have berms across them and the basement floors will be coated to provide secondary containment. See Figure 3-1 for the main floor layout. Both the main floor and lower level will be equipped with a wet fire suppression system.

Chemical Prep/Make-up Room: The Chemical Prep/Make-up Room is located at the main floor of the south corner of Building 910. The room contains the nitric acid make-up tank and will be used for the pH adjustment. The east side of this room will be used as a general laboratory, containing nitrate analysis equipment, a pH and conductivity meter. The emergency showers and eye wash are located in this room. All of the doorways will have berms across them, and the floors will be coated with a sealant to provide secondary containment. See Figure 3-1 for the main floor lay-out.

Lower Level Building 910

Six existing tanks on this level will be used as temporary holding tanks for the evaporation products. These tanks will be structurally and seismically qualified for the new application. All six tanks have been inspected for RCRA compliance in accordance with 6 CCR Section 265-191 and for seismic qualification by a qualified professional engineer. Required actions have been incorporated into the installation plan and certification will be issued when the installation has been completed. The distillate will be held in Tanks D-2, D-6, and D-7. The concentrate (brine) from the MEMs units will be held in Tanks D-9 and D-18. Tank D-10 will be used as a surge tank for the distillate system. In addition, a new 600 gallon stainless steel tank D-50 will be used for brine flushing. Pumps for recirculation and transfer of materials will be located on this level. The floor and sump of the lower level will be coated with a sealant to serve as secondary containment for all the equipment within the building. The sump will have one layer of 60 mil high density polyethylene liner on top of the sealant leak detection device. The sump will be lined to meet the requirements of 6 CCR 1007-3 and piping will ensure sump liquids are not discharged outside the containment of Building 910. The containment volume will be 110 percent of the volume of the largest tank located within Building 910. See Figure 3-2 for the lower level floor lay-out.

Auxiliary Equipment

Each of the 207-A and 207-B Solar Ponds will have a pump inside the Pond berm connected to a double containment pipe with leak detection to supply water to the evaporators.

A 2500 gallon stainless steel tank located north of the building 910 will be used to hold scale inhibitor EDTA.

Tank 215-D, which has a capacity of 500,000 gallons, is located to the west of Building 910, north of Building 928. This tank will be used as a holding tank from which the distillate will be supplied on demand into the raw water or condensate systems.

A 500-gallon stainless steel tank located to the east of building 910, will be used to hold nitric acid for pH adjustment.

Three portable cooling towers, which will provide cooling water to the three portable evaporation system, will be located to the north of Building 910.

3.1.1.2 Process Description

A conceptual flow diagram of the three portable evaporators is provided in Figure 3-3. The water from Pond 207-A and Ponds 207-B North, Center, and South and ITS water will be pumped via a double-pipe transfer line which will connect to a manifold station equipped with duplex strainers and duplex filters. The duplex strainers will trap the material of a size that cannot pass through 1/8" to 3/16" perforations. An in-line 100 micron duplex filter will trap the sediments that occasionally are picked up by the transfer pumps. The strained and filtered material will be handled as low level mixed waste as specified by existing RFP waste guidance. The brine produced by the VC unit will be fed to the preheater of the MEMS flash evaporator. The preheated pond water or ITS water will be fed to the VC unit for evaporation. The distillate will be collected from the VC unit and the MEMS flash evaporator unit into two separate small surge tanks. From the surge tanks, distillate below a conductivity of 150 micro mho/cm will be discharged into one of three 7,000-gallon batch tanks. Distillate exceeding 150 micro mho/cm will be recycled, by a solenoid operated valve actuated by the conductivity probe, back to the feed stream for reprocessing. An automatic composite sampling process will be initiated at the beginning of discharge into the 7000 gallon batch tanks. When the accumulated distillate level reaches the highlevel setpoint on the batch tank, the composite samples will be collected and sent to the laboratory for analysis as specified in the Waste Analysis Plan (WAP). Sections 3.1.1.3 and 3.1.1.4 of this document explains the sampling and analytical requirements in detail. The distillate will then be transferred to the 500,000-gallon distillate holding tank 215D. From Tank 215D, the distillate will be injected into the Raw Water System for plant cooling tower usage on a demand basis. The concentrate from the MEMS flash evaporator will be collected in holding tanks before being transferred to the pondcrete cementation process or Building 374 saltcrete process. A composite sample of the concentrate will be manually collected for analysis as specified by the pond sludge solidification process or the saltcrete process as applicable.

Process Performance

Each portable evaporator system (VC unit in series with MEMS flash evaporator) has a designed output of 18,000 gallons per day. There are three identical systems installed in parallel so that an operator can operate any combination of the three systems simultaneously. The system will be capable of producing a product water quality of 150 micro mho/cm or better and meeting general characteristic of commercially available raw water. The Waste Sampling Plan in this document (Appendix B) provides the specific constituents to be analyzed and the acceptable action levels. Final concentrate produced will be controlled to reach a total dissolved solids (TDS) level ranging between approximately 300,000 ppm and 400,000 ppm.

Logistics of Pond Water Removal

The three portable evaporator systems will have the capability to treat the water from one pond or a combination of ponds. However, neither treated pond water nor byproduct from the evaporator will be returned to any of the four ponds after the initial verification process has been completed. During initial verification, the water may be discharged to the pond from which it came.

Distillate Disposition Plan

Upon approval of analytical results from the acceptance phase, distillate will be produced on a production basis and will meet all performance specifications of the WAP prior to being transferred to the Tank 215-D (500,000 gallon capacity). From there, the distillate will be pumped into the Raw Water header on a demand basis by a centrifugal pump. The distillate pumped into the Raw Water Header will be used by plant cooling towers. The cooling tower blow down stream will be discharged to the Sanitary Treatment Plant of RFP.

The distillate from tank 215-D may be used as plant boiler feed water when the cooling tower demand falls. For use as feed, operations will pump the distillate into the condensate return receiver which is located in Building 910. This will allow the distillate to be discharged into the 300,000 gallon condensate tank located in Building 443 for supply of boiler feed water.

Concentrate Disposition Plan

The concentrate will be collected in the concentrate holding tank before being transferred to the pondcrete cementation process or to the Building 374 saltcrete cementation process by a tanker truck.

Flow, Level and Spill Control

The main feed stream, final distillate stream, and the final concentrate streams will be monitored for flow rate and will have a continuous flow indication of the total volume transferred. All collection tanks and holding tanks will be equipped with a high level alarm control and an automatic pump shut off to prevent overflow of liquid. The 500,000-gallon distillate holding tank 215D will not have secondary containment, because distillate held in Tank 215D has been proven to meet the "re-use" criteria as stated in the WAP (Appendix B) and thus there will be no release of contaminants that may threaten human life or the environment. Tank 215D will be equipped with a high level alarm and a secondary high level alarm. The high level alarm alerts the operators to stop evaporation. The secondary high level alarm will automatically shut down the transfer pumps that feed into the 500,000-gallon holding tank.

3.1.1.3 Sampling and Analytical Requirement

The purpose of the sampling plan is to ensure the distillate will be an effective substitute for water used in the raw water system and therefore demonstrate that the distillate would have no adverse impact on the quality of the water discharged from the plant or emitted from cooling tower.

Detailed characterization of pond water was recently performed and the data is presented in Tables 2.1 through 2.6. All analytical procedures follow EPA SW-846 methods. Level IV, which is characterized by rigorous QA/QC protocols and documentation, was used for analysis of all constituents. This level provides legally defensible qualitative and quantitative data. The constituents analyzed consisted of the parameters currently measured during the monthly sampling of the Building 374 evaporator distillate and the parameters required for sampling of water discharged from the plant. Distillate from the 374 evaporator is currently reused in the building 374 cooling tower. The WAP detailed in Appendix B implements the necessary actions to ensure that the distillate from these portable flash evaporators will also be an acceptable substitute for raw water.

3.1.1.4 Waste Analysis Plan (WAP)
The foundation for the development of the WAP is the characterization data presented in Tables 2.1 through 2.5 for the Solar Ponds and Table 2.6 for the ITS waters. Constituents not found within the characterization reports have been deleted from the WAP.

3.1.1.5 Facility Safety Features

Fire Protection and Safety Equipment
There will be a new wet fire suppression system installed to cover the

entire building. Approximately five fire extinguishers will be provided throughout the entire building. Fire phones, safety shower(s) and eye wash equipment will be located to adequately provide for personnel safety protection.

Alarms
The following is a list of the alarms for both the process and personnel:

Process

- Over temperature alarm(s) - Audible, Visual
- High/low level alarm(s) - Audible, Visual
- Power overload alarm(s) - Audible
- Loss of vacuum alarm(s) - Audible, Visual
- Low flow alarm(s) - Audible, Visual
- Conductivity level high alarm(s) - Visual.

Personnel
Fire alarm - Audible, Visual

Inspection
Inspection requirements of the facility will comply with the appropriate procedures for operation of the system. Tanks containing RCRA regulated waste will be included in the Plant Assessment/Surveillance Program.

Operating Procedures
Operation of all equipment in this facility will follow the appropriate procedures. Procedures will be completed at the completion of equipment installation. Final walkdown of the procedures and revalidation will occur prior to equipment operation. The following is a list ofprocedures that will be implemented prior to equipment operation.

- WO-2210 Systems Line-up
- WO-2211 Chemical Makeup System
- WO-2212 Feed System
- WO-2213 Evaporator System 1
- WO-2214 Evaporator System 2
- WO-2215 Evaporator System 3
- WO-2216 Distillate System
- WO-2217 Concentrate System
- WO-2218 Abnormal/Emergency Response
- Alarm Response Procedure
- Site Specific Health and Safety Plan

Spill Response
The spill response will be in accordance with the plant spill response procedure as contained in the Hazardous Waste Requirements Manual 1-10000HWRM.

Personnel Training
Rocky Flats personnel assigned to operate the Building 910 evaporators will receive the following training:

- Rocky Flats core and area-specific training
- 40-hour OSHA
- Annual RCRA Training
- On-the-Job training provided by the evaporator manufacturer during the initial trial run
- Job-specific training to include theory of operations, system components, principles of operations, system interrelationships, protective devices, and practical factors.

3.1.2 Storage Components

Water collected by the ITS is currently returned to the 207-B ponds(primarily the North impoundment). To allow pond dewatering to proceed, the ITS water will be held in three temporary surge tanks.

3.1.2.1 Location of Tanks

The three temporary surge tanks will be located well within the plant's buffer zone, north of the SEPs (see Figure 3-4).

The proposed site is not located within the 100-year floodplain, wetlands, a saltdome formation, underground cave or mine, or within 200 feet of a fault displaced by a Holocene Fault. The proposed site is not an area of known contamination and is not within a solid waste management unit. Furthermore, the proposed site would have no impact on known archaeological or historic resources and is not expected to affect the black-footed ferret or the bald eagle (DOE, 1991b).

Excavation and grading will be required to prepare the site for the temporary tanks. The site will be graded according to specifications as established in the geotechnical study of the proposed site. Excavation permits will be reviewed and approved by appropriate environmental management staff prior to any work on this site. Measures will be implemented for erosion control and soil stabilization and to facilitate restoration of the pads after the tanks are removed.

3.1.2.2 Equipment Description

Each tank will have a capacity of approximately 500,000-gallons and will be constructed of galvanized steel and high-density polyethylene (HDPE). Each tank will be approximately 112 feet in diameter with

10 foot galvanized steel sidewalls. The bottom and inner sidewalls will be double-walled with HDPE (see Figure 3-5).

The temporary holding tanks and ancillary equipment will be designed, installed, and operated in accordance with the tank requirements of 6 CCR1007-3 Part 264, Subpart J. The tank systems will incorporate double-wall containment features and provisions for detection and removal of primary containment leakage (EG&G, 1991a).

The subgrade will be prepared and graded to allow any leakage to be collected at the leak detection sump. Non-earthen base material (i.e., concrete and/or asphalt) will be placed over the subgrade to provide structural support for the base of each surge tank. A 100-mil geotextile will be placed over the concrete/asphalt base to protect the secondary wall from punctures or abrasions. A 80-mil HDPE secondary wall will then be placed over the geotextile. A HDPE geonet will be placed over the secondary wall to allow any leakage through the primary wall to be immediately collected in the leak detection sump. A 80-mil HDPE primary wall will then be placed over the geonet. In addition, a 20-mil HDPE liner will be placed over the primary wall to protect the primary wall from ultraviolet degradation. The leak detection sump will be located in the middle of each tank and will incorporate below grade piping to a standpipe located outside the tank which will allow the immediate detection of any leakage through the primary wall. The standpipe will be provided with a sensing device. In the event leakage occurs, an alarm will sound in Building 374 which is continuously manned 24 hours a day. If a valid leak occurs, the contents of the tank with the leak will be pumped to another tank. At least one tank will remain empty to provide this capability.

Water will be pumped from the existing ITS pump house to the tanks and then from the tanks to the three portable evaporators via double-walled piping. Above ground piping will be made of polyvinylchloride and underground piping will be made of polyethylene. All exposed portions of the piping will be heat-traced, insulated, or drained for freeze protection.

In order to prevent overfilling, each holding (surge) tank will beequipped with a high level and low level alarm. The high level alarm will activate when there is approximately 2 feet of freeboard remaining in the tank(s). The freeboard capacity will allow approximately 15 hours of normal fill time. Upon activation, the high level alarm will automatically shut down the feed pumps and begin pumping excess water to an adjacent surge tank which is not full. In addition, the alarm signal will be sent to Building 374 which is continuously manned 24 hours a day.

3.1.3 General Components

3.1.3.1 Quantity of Waste to be Treated

The largest volume solar evaporation pond (Pond 207-A) contains approximately 3 million gallons of water to be evaporated to allow pondcreting of sludges to occur. The 207-B ponds contain a total of approximately 5 million gallons of water to be evaporated. The collected ITS water, which will be stored in the temporary surge tanks and will be a continuing source of water, will require treatment through the evaporator system. The average amount of water collected by the ITS over the course of a year is estimated to be 4 million gallons, based on observations made in 1987.

As previously mentioned, each portable evaporator system has a design output of 18,000 gallons per day. Therefore the utilization of all three systems would have a treatment capacity of 54,000 gallons per day.

3.1.3.2 Treatability Testing

Treatability tests were performed using the proposed treatment system by LICON, Incorporated of Pensacola, Florida (LICON, 1990). In that LICON was not an authorized recipient of pond water, tests were conducted using surrogate pond water. Tests were conducted with feed supply prepared to simulate each of the four SEPs. The surrogate feed supplies were prepared based on the major ions contained in their respective ponds.

Test results indicated that the 10,000 ppm total dissolved solids feed supply (pond average) could be reduced to 1/50th of its present volume and produce an excellent quality of distillate averaging less than 75 mhos/cm. According to recent pond water detailed characterization results, the heavy radionuclides such as U, Pu, and Am detected, are at a treatable level with a high performance type of demister pad. Although tritium was detected, the level was well below established drinking water standards.

A trial run (acceptance phase) of the installed system will be conducted and evaluated prior to full-scale operations. The trial run period will include extensive sampling and analysis of the distillate per the analysis plan. This trial run and testing period will also be used to adjust operations and train operators.

3.1.3.3 General Inspections

Inspections of the storage and treatment operations will be conducted in accordance with the applicable requirements of 6 CCR 1007-3 Part 264, standard plant operating procedures, and as needed. Specific inspection schedules and record keeping procedures will be developed and implemented prior to initiating operations. Inspections will be conducted at a frequency which identifies problems in time to correct them, prevents human health and environmental hazards, and ensures safe working conditions.

During operations:

- Tank leak detection systems
- Level of water and freeboard in the tanks
- Ancillary equipment
- Above-ground tank equipment (piping, valves, etc.)
- Structural integrity of the tanks
- Area surrounding the tanks
- Loading and unloading areas of hazardous waste.

Other items to be inspected will include, but not be limited to:

- Operating and structural equipment
- Safety and emergency equipment
- Monitoring equipment
- Security devices
- HEPA filters.

3.1.3.4 Management of Waste

As mentioned previously, the concentrate generated by the evaporator system will be collected in the concentrate holding tank and will also be sampled for waste characteristic data before being transferred to either the pondcrete cementation process or to the saltcrete process.

The distillate (water) generated by the evaporator system will not constitute a solid and hazardous waste because it will be used or reused as an effective substitute for a commercial product. Therefore, the distillate is not a waste based on the commercial product exclusion contained in 6 CCR 1007-3 Part 261.2 (e)(ii). The distillate (water) will be used or reused as an effective substitute for commercially available water that could or otherwise would be purchased from the Denver Water Board (DOE, 1989a).

3.1.3.5 Institutional Controls

This IM/IRA will be conducted entirely within the Rocky Flats site boundary. Since current security controls (i.e., access control, fencing, etc.) do not allow the general public into the area of this IM/IRA, additional institutional controls are not warranted.

3.1.3.6 Assumptions, Uncertainties and Contingencies

As detailed in the process description for the evaporator system, distillate not meeting specified quality requirements will be recirculated for additional treatment. In the event that specific quality requirements are not obtained by the proposed system, additional treatment units will be evaluated and incorporated into the treatment system as needed to meet or exceed performance requirements.

Each temporary surge tank will be equipped with a leak detection system. If a valid leak is detected, the tank contents will be transferred to an adjoining tank. In the unlikely event that a catastrophic failure of a tank occurs, the released water would flow into North Walnut Creek. Much of the water would percolate back into the ground water system. The remainder would be contained in Pond A-3 because ponds A-1 and A-2 are not tributary to Walnut Creek. Sampling of Pond A-3 would then occur. If so determined, the water could be collected and transferred to one or both of the remaining tanks or transferred to the SEPs.

3.1.3.7 Closure of IM/IRA Structural Components

It is anticipated that the temporary surge tanks will be utilized at least into 1995. The tanks may be utilized as part of the initial action that may be required following the Phase I RFI/RI source and soils characterization as defined in the IAG. The temporary tanks will then be replaced by permanent tanks if deemed appropriate. The temporary tanks and ancillary equipment will be closed in accordance with the closure requirements of 6 CCR 1007-3 Part 264, Subpart G.

3.1.4 Costs

The estimated total cost to conduct this IM/IRA is $8,017,000. A breakdown of the estimated capital and operating and maintenance costsassociated with this IM/IRA are included in Table 3.1. This cost is only for the water evaporative efforts and does not include the cost of processing the pond sludge into pondcrete.

3.1.5 Remediation Goals and Performance Standards

The overall goal of this IM/IRA is to remove the liquids from SEPs (207-A, 207-B North, 207-B Center, and 207-B South) as expeditiously as possible in order to be able to remove and solidify the remaining sludges.

An associated goal is to implement a means to store and treat water collected by the ITS which does not include the use of the SEPs.

The proposed site for the three temporary surge tanks complies with all applicable siting criteria. The proposed site for the temporary tanks is not located within the 100-year floodplain, wetlands, a saltdome formation, underground cave or mine, or with 200 feet of a fault displaced by a Holocene Fault. The proposed site is not an area of known contamination and is not within a solid waste management unit. Furthermore, the proposed site would have no impact on known archaeological or historic resources and is not expected to affect the black-footed ferret or the bald eagle (DOE, 1991b).

The principal compliance point is where the distillate enters the raw water system, specifically in the 7,000-gallon capacity batch tanks.

Numerical goals to be attained for the distillate include:

- The maximum contaminant levels (MCLs) as identified in 40 CFR Part 141 Subpart B with the exception of turbidity and microbiological contamination

- The surface water standards for Walnut Creek as identified in 5 CCR 1002-8, Section 3.8.6 (2), Table 2 - Site Specific Radionuclide Standards.

No numerical goals apply to the sludge concentrate. However, the concentrate will be managed within the pondcrete or saltcrete operations in accordance with RCRA regulations for hazardous waste treatment and storage facilities (6 CCR 1007-3 Part 264).

3.1.6 Proposed Schedule of Milestones

The proposed schedule has been established to allow the DOE to meet its IAG obligations for Operable Unit 4 and facilitate meeting commitments developed in the AIP. The proposed milestone schedule is provided in Table 3.2.

3.2 ANALYSIS OF SELECTED REMEDY

This section provides an analysis of the selected remedy in accordance with the NCP. The analysis consists of an assessment of nine evaluation criteria.

3.2.1 Overall Protection of Human Health and the Environment

The selected remedy has been assessed to determine whether it can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site by eliminating, reducing, or controlling exposures to levels consistent with the remediation goals. Overall protection of human health and the environment has considered the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

A summary of the site risks has been included in Section 2.6 of this document. This section assessed the potential risks to human health as a result of the flash evaporator (treatment) operation. The assessment indicated that the potential risks to the off-site general public and on-site workers would be negligible.

The implementation of this IM/IRA is not expected to pose any adverse effects to the environment. In fact, a consequence of this IM/IRA will allow the removal of potential contamination source material from the SEPs, thereby reducing the potential of further contamination of the underlying soils and ground water.

3.2.2 Compliance with ARARs

The selected remedy has been assessed to determine whether it attains ARARs under federal environmental laws and state environmental or facility siting laws or provides the grounds for invoking one of the waivers. The selected remedy will attain identified ARARs. Please refer to Section 4.0 of this document for a detailed discussion of ARARs. No waiver requests are expected at this time.

3.2.3 Long-Term Effectiveness and Permanence

The selected remedy has been assessed for the long-term effectiveness and permanence it affords along with the degree of certainty that the remedy will prove successful.

Long-term effectiveness and permanence is a key consequence of the selected remedy. The dewatering of the SEPs will allow the removal and solidification of existing sludge material to occur, thereby allowing closure activities to proceed in an expeditious manner.

The waste remaining after this IM/IRA will be the dewatered sludges left behind in the SEPs. The sludges will then be solidified in accordance with approved pondcrete operations. The removal of the liquids and sludges from the SEPs will benefit ground water quality in the long term, because the contamination sources will be removed.

The proposed treatment system and storage tanks are considered adequate and reliable to meet the objectives of this IM/IRA.

3.2.4 Reduction of Toxicity, Mobility or Volume through Treatment

The degree to which the selected remedy employs recycling or treatment that reduces toxicity, mobility, or volume has been assessed, including how treatment is used to address the principal threats posed by the site.

The proposed mechanical/thermal forced evaporation system willsignificantly reduce the volume of waste currently contained in the SEPs. Approximately 8 million gallons of liquid will be treated from the ponds.

The removal of this liquid will allow the pondcrete process to occur, thereby reducing the mobility of contaminants in the underlying ground water by eliminating the source.

The evaporation system produces a distillate and a concentrate. The distillate produced will be of high water quality, suitable for use in the plant's raw water supply. The volume of waste concentrate produced is estimated to be 1/50 of the present pond volume.

3.2.5 Short-Term Impacts

The short-term impacts of the selected remedy has been assessed considering potential risks to the general public, workers and the environment.

The potential risks to the general public health and safety during implementation of this IM/IRA are considered minimal.

Volatile chemical emissions from the forced evaporators are expected to be insignificant, because volatile organic concentration in the ITS water have only been sporadically found near the detection limits. The forced evaporator process will be equipped with HEPA filters at the concentrate surge tanks thereby precluding the carry-over of radioactive particulate emissions.

The risk of a catastrophic failure of a temporary surge tank is considered minimal. In such an event, contingencies as per the Surface Water Management Plan are in place to prevent off-site migration of potentially contaminated water.

The potential risks to workers during implementation of this IM/IRA will be minimized to the maximum extent possible. Workers will be trained in and be required to comply with necessary health and safety procedures. Standard operating procedures will be developed for the evaporation process. Personnel protective equipment will be used in accordance with applicable procedures.

The potential environmental risks associated with the implementation of this IM/IRA are considered minimal.

3.2.6 Implementability

The ease or difficulty of implementing the selected remedy has been assessed by considering the technical feasibility, the administrative feasibility, and the availability of services and materials.

The technical feasibility to conduct this IM/IRA is considered very good. The construction and operation of the temporary surge tanks and the evaporator system will follow standard proven practices. Both the storage and treatment systems will be monitored in accordance with the WAP to ensure that the performance objectives are met. met. Equipment parameters will be logged and the logs retained at the facility. All RCRA tanks and the storage tanks will be included in the Plant Material Assessment Program. The treatment system can be adjusted or modified as necessary to meet the required performance standards.

No problems are anticipated relating to administrative feasibility of this IM/IRA. The necessary funds are available. Furthermore, this IM/IRA will be conducted entirely on-site.

No problems are anticipated with the availability of the needed services and materials to construct and implement this IM/IRA.

3.2.7 Cost

The types of costs associated with the selected remedy have been assessed.

The costs associated with this action are considered necessary for the protection of human health and the environment, and to meet the intent of the IAG and AIP.

A breakdown of the estimated capital and operating and maintenance costs associated with this IM/IRA have been previously included in Table3.1.

3.2.8 State Acceptance

The assessment of State concerns will be made following the State's review and comment on this proposed IM/IRA Decision Document.

3.2.9 Community Acceptance

The assessment of community concerns will be made following the public comment period for this proposed IM/IRA Decision Document.

4.0 IDENTIFICATION AND ANALYSIS OF POTENTIAL ARARs

4.1 STATEMENT AND BASIS OF PURPOSE OF POTENTIAL ARAR ANALYSIS

The analysis of ARARs in Section 4.0 is a review of Potential ARARs for this IM/IRA only. ARARs are currently being negotiated and resolved by the DOE, EPA and CDH on a site-wide basis for the Rocky Flats Plant. Appendix D contains two documents, a letter/agreement dated August 22, 1989 from DOE to CDH concerning water recycling and reuse issues and an initially approved air emission permit number 91JE316(1) from CDH for the flash evaporators as outlined in this IM/IRA. These documents as agreed to by DOE, EPA and CDH are compliance related ARARs for this IM/IRA. Also, Maximum Concentrations Limits (MCL) for radioactive constituents as presented in Table 4-3 shall be observed as compliance ARARs for the IM/IRA.

4.2 SCOPE OF INTERIM MEASURES/INTERIM REMEDIAL ACTION

The overall objectives of this IM/IRA for the 207- Solar Evaporation Ponds and ITS is to facilitate pondcrete operations and to facilitate the closure of the 207- Solar Ponds. ARARs are used in defining the remediation goals for the interim action.

4.3 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The NCP [FR Vol 55, No. 46, 8848; 40 CFR 300.430 (e)] requires that, in development of remediation goals, the following be considered:

1. ARARs

2. For systemic contaminants, concentration levels that will not cause adverse effects to the human population and sensitive subgroups over a lifetime of exposure

3. For carcinogens, exposure levels represent an upper bound lifetime cancer risk between 10^{-4} and 10^{-6}. The 10^{-6} risk level is to be used as a point of departure when ARARs are not available or are not sufficiently protective because of multiple contaminants or multiple exposure pathways.

4. Factors related to detection limits

5. For current or potential sources of drinking water, attainment of Maximum Contaminant Level Goals (MCLGs) or Maximum Contaminant Levels (MCLs), if MCLGs are zero

6. Attainment of Clean Water Act (CWA) water quality criteria where relevant and appropriate.

The IAG, in paragraph 150, states "Interim Remedial Actions/Interim Measures shall, to the greatest extent feasible, attain ARARs." Also for interim actions, the NCP [40 CFR 300.430(f)] specifically notes that an ARAR can be waived if the action is to become part of the final remedy that will attain ARARs. It may not be practicable to attain all ARARs for this interim action and ARAR waivers or alternate concentration limits may be requested.

This section identifies and analyzes ARARs relevant to the solar evaporator ponds 207-A and 207-B and the surface and ground water from the underground ITS and discusses how the action will be protective of human health and the environment. This remedial action is considered an on-site IM/IRA to be administered under RCRA; therefore, both substantive and administrative requirements of the RCRA regulations (such as RCRA permitting requirements) apply. The CERCLA-based ARAR process for this IM/IRA is required under the IAG.

4.3.1 ARARs

"Applicable requirements," as defined in 40 CFR 300.5, means "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable." "Relevant and appropriate requirements," also defined in 40 CFR 300.5, means "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws, that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate."

According to CERCLA Section 121(d)(2), in order to be considered an ARAR, a state requirement must be "promulgated". As defined in 40 CFR 300.400(g)(4) of the NCP, the term "promulgated" means that the requirement is of general applicability and is legally enforceable.

4.3.2 TBCs

In addition to ARARs, advisories, criteria, or guidance may be identified "to be considered" (TBC) for a particular release. As defined in 40 CFR 300.400(g)(3), the TBC category consists of advisories, criteria, or guidancedeveloped by EPA, other federal agencies, or states that may be useful in developing remedies. Use of TBCs is discretionary rather than mandatory as is the case with ARARs.

4.3.3 ARAR Categories

In general, there are three categories of ARARs. These categories are:

- Ambient or chemical-specific requirements

- Location-specific requirements

- Performance, design, or other action-specific requirements.

Each category is discussed in more detail below.

4.4 AMBIENT OR CHEMICAL-SPECIFIC REQUIREMENTS

Ambient or chemical-specific requirements set health- or risk-based concentration limits in various environmental media for specific hazardous substances or pollutants. These requirements set protective cleanup levels for the chemicals of concern in the designated media, or may act as action-related requirements in indicating a safe level of air emission or wastewater discharge. The chemical-specific ARARs identified herein are used in defining the remediation goals for clean up of contaminated surface water and discharge of treated water.

ARARs are derived primarily from federal and state health and environmental statutes and regulations. The following may be considered when establishing clean-up standards, but are not considered ARARs: health effects assessments, health advisories, chemical advisories, and guidance document criteria. These and any proposed standards are classified as items to be considered, or TBCs. Where background concentrations for constituents are above the ARAR for that constituent, a waiver from the ARAR may be appropriate. A summary of ARARs for the contaminants found in the surface and ground water of OU4 are presented in Tables 4.1 through 4.3. Table 4.3 presents ARARs for volatile organics, metals, conventional pollutants, and radionuclides and will be applied tooperations involving treated water.

As discussed in 55 FR 8741 (Preamble to the NCP), when more than one ARAR has been identified for a contaminant, the most stringent standard has been identified as the ARAR which the IM/IRA will attain to the greatest extent practicable. Where no ARAR standard exists, a TBC standard has been identified which the IM/IRA will treat as a goal to achieve. Federal and state ARAR spreadsheets used in the ARAR analysis for volatile organics, metals, conventional pollutants, and radionuclides are presented in Tables 4.1 and 4.2. The standards identified in Table 4.3 are based on the most stringent standards found in the Safe Drinking Water Act (SDWA) MCLs and Water Quality Control Commission (WQCC) statewide surface water standards. As described in Sections 4.3.1 through 4.3.5, the standards mentioned above were found to be applicable or relevant and appropriate to RFP Solar Ponds 207-A and 207-B and the ITS waters.

The standards and criteria identified as TBC in Table 4.3 are based on the most stringent standards found in WQCC Site-Specific Surface Water Standards and criteria in Tables I, II, and III of 3.1.16 in the Basic Standards for Surface Water. Additionally, CWA Ambient Water Quality Criteria (AWQC) were applied whenever more appropriate ARARs or TBCs were not identified. Overall, TBC standards were identified in Table 4.3 only when no ARAR standards were found.

As presented in Tables 4.1 and 4.2, the ARARs and TBCs summarized in Table 4.1 were developed using the ARARs rationale described above and were identified by examining the following standards and criteria:

- SDWA MCLs

- Colorado WQCC Standards for Surface Water

- CWA AWQC.

ARARs were not considered for the distillate from the evaporator. The distillate is not a solid or hazardous waste because it is excluded from regulation pursuant to 6 CCR 1007-3, Part 261.2 (e)(ii).

This IM/IRA is limited in scope and only those ARARs associated with the activities and goals of the IM/IRA are evaluated. The ARARs associated with the effluent, sludge, air discharges, and construction and operation of the treatment units and tanks were considered. All other ARARs will be addressed in the forthcoming record of decision for OU4.

4.4.1 Safe Drinking Water Act MCLs

SDWA MCLs represent the maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system [40 CFR 141.2(c)]. The OU 4 water to be treated according to this IM/IRA will be reused as an effective substitute for commercially available raw water. As directed by CDH, OU 4 treated water will be required to meet MCLs because CDH has determined that this water must meet the same water quality (drinking water quality, except for turbidity and microbiological contamination) as water provided from the Denver Water Board (DOE, 1989a).

Consequently, MCLs are regarded as ARARs. Furthermore, the NCP [40 CFR 300.430(e)] requires that, in development of remediation goals for evaluating alternatives for final remediation, the following be considered for current or potential sources of drinking water: attainment of MCLGs or MCLs, if MCLGs are zero, where relevant and appropriate; and attainment of CWA AWQC, where such criteria are relevant and appropriate. CWA AWQC are discussed in Section 4.3.5. It should be noted that on January 30, 1991, and June 7, 1991, (56 FR 3526 and 56 FR 26460, respectively) EPA published final rules amending MCLs and MCLGs for a number of the constituents identified in Table 4.3. These standards are effective July 30, 1992, and November 6, 1991, respectively, and will be regarded as applicable at that time. For purposes of this workplan, the new MCLs (MCLGs are zero or equal to the MCLs, except in the case of copper), are, therefore, relevant and appropriate and are identified as such in Table 4.3.

4.4.2 Colorado WQCC Standards for Surface Water

The Colorado WQCC has established both state-wide and stream segment-specific standards for the protection of state surface waters. State-wide standards exist for certain radioactive materials as well as organic standards adopted for all state sources of drinking water and areas requiring protection for aquatic life (see Section 3.1.11, 5 CCR 1002-8). These standards are consequently of general applicability. The state-wide standards are enforceable through the state's NPDES permitting process. Having apparently met the NCP state ARAR requirements of enforceability and general applicability [40 CFR 300.400(g)(4)], the state-wide surface water standards have been applied as ARAR in Table 4.3.

Site-specific surface water standards also exist for certain organics, metals, inorganics, and radioactive constituents in the form of goals for Segment 5. Accordingly, these standards do not appear to satisfy the NCP requirements for state ARARs since all segment 5 standards and classifications are goals. These standards have not been generally applied to the surface waters of Colorado. Furthermore, the site-specific standards for radioactive constituents are significantly more stringent than any standards applied to the surface waters of the State of Colorado. Consequently, the site-specific organic, metal, inorganic, and radionuclide surface-water standards cannot be ARAR. These standards have been applied as TBC in Table 4.3 because they reflect the degree of protectiveness determined to be necessary for Rocky Flats Plant surface waters by the Colorado WQCC.

4.4.3 CWA Ambient Water Quality Criteria (AWQC)

The CWA AWQC are non-enforceable guidance developed under CWA Section 304, and are used by states in conjunction with designated stream segmentusages to establish water quality standards for the protection of aquatic life and for the protection of human health. Standards include those established for drinking water and fish consumption, fish consumption only, as well as standards for the protection of aquatic life. CERCLA Section 121(d) requires that CWA AWQC be considered in the development of remediation goals in the FS process, where relevant and appropriate. Relative to this IM/IRA, AWQC are generally considered relevant and appropriate. Pursuant to the preamble of the NCP and EPA guidance (55 FR 8754; EPA, 1990), AWQC will generally not be considered relevant and appropriate whenever other standards exist that are specific to the constituents and the use of the affected water. Consequently, since the WQCC has designated RFP surface waters as drinking water usage and aquatic life protection stream reaches with associated standards, the AWQC were used as ARAR in Table 4.3 only when more appropriate Federal or Colorado standards were unavailable.

4.4.4 Protection of Human Health and the Environment

As illustrated by the hazard quotients and carcinogenic risks listed in Table 4.3, achieving the ARARs should result in a clean-up action that is protective of human health and the environment. For non-carcinogens, the protectiveness goal is a hazard index of 1. The hazard index is the sum of the hazard quotients [i.e., the estimated daily intake (dose) to reference dose ratios] for all of the contaminants combined, which have been computed and are presented in Table 4.3. In assessing non-carcinogenic risk, a hazard index of one or less is considered to be acceptable. If the hazard index exceeds one, it indicates that there might be the potential for adverse non-carcinogenic health effects occurring. Unlike the method used to evaluate the potential for carcinogenic toxicity, the hazard index does not indicate the probability of adverse health effects occurring, but it is used as a benchmark for determining where there is a potential concern. With respect to carcinogens, cumulative cancer risk should be less than 10[-6], but no greater than 10[-4] (individual cancer risks shown in Table 4.3 are considered additive). As noted in Table 4.3, the calculated incremental cancer risks exceed 10[-4] for some of the organic carcinogens as well as for beryllium. However, the cancer risks are computed on the basis of the detection limit and therefore can only be considered a possible maximum carcinogenic risk; the actual risk is unknown but likely to be considerably lower. Removing these contaminants to non-detectable levels and attaining, to the extent practicable, the other ARARs, the IM/IRA is considered protective of human health and the environment.

4.5 LOCATION SPECIFIC REQUIREMENTS

Location-specific ARARs are limits placed on the concentration of hazardous substances or the conduct of activities solely because they occur in certain locations. These may restrict or preclude certain remedial actions or may apply only to certain portions of a site. Examples of location-specific ARARs which pertain to the IM/IRA are federal and state siting laws for hazardous waste facilities (40 CFR 264.18, fault zone and floodplain restrictions), and federal regulations requiring that actions minimize or avoid adverse effects to wetlands (40 CFR Part 6 Appendix A and 40 CFR Parts 230-231).

More specifically, in addition to the requirements described above, pertinent location-specific ARARs include: Colorado requirements for siting of hazardous waste facilities and wastewater treatment facilities (Colorado Revised Statute 25-15-101, 203, 208, 302 and 25-8-292, 702, respectively), National Historic Preservation Act requirements for preservation of significant articles and historic properties (36 CFR Parts 65 and 800, respectively), federal critical habitat protection requirements (50 CFR Parts 200, 402 and 33 CFR Parts 320-330), and federal requirements for the protection of fish and wildlife resources (40 CFR 6.302). A summary of location-specific ARARs which the IM/IRA will attain to the greatest extent practicable is presented in Table 4.4.

4.6 PERFORMANCE, DESIGN, OR OTHER ACTION SPECIFIC REQUIREMENTS

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants. These requirements are not triggered by the specific chemicals present at a site, but rather by the particular IM/IRA evaluated as part of this plan. Action-specific ARARs are technology -based performance standards, such as the Best Available Technology (BAT) standard of the Federal Water Pollution Control Act. Other examples include RCRA treatment, storage, and disposal standards. Action-specific ARARs, which the IM/IRA will attain to the greatest extent practicable, are included in Table 4.5. Solar pond sludges and precipitate from the Building 910 flash evaporators will be treated under pondcrete operations. Therefore, RCRA LDR [40 CFR Part 268.40] requirements are not relevant and appropriate to the scope of this IM/IRA. RCRA LDR requirements will be considered in the final SEP remediation decision process.

As explained in the National Contingency Plan (see 55 FR 8666) OSHA requirements for worker protection in hazardous waste operations and emergency response (29 CFR 1910.120) are applicable to workers involved in hazardous substance-related activities, as well as other OSHA requirements related to specific circumstances or activities. These requirements must be satisfied, however, the requirements are not environmental in nature, and therefore are not considered ARARs.

5.0 EXPLANATION OF SIGNIFICANT CHANGES TO THE IM/IRA

Significant changes which change or alter this IM/IRA may result based on comments received by the public, EPA or the State. DOE will respond to comments which change or alter the selected remedy and will included those responses in the Final Decision Document for this IM/IRA. Comments have not been received that require a change in the selected remedy.